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1 INTRODUCTION

In this thesis i am going to discuss the rise of Artificial Intelligence. The story of AI starts officially in the XX century, specifically around the 50s, but society started implementing this system only in a more modern era, almost in every sector or, sometimes we don’t even think about it, in everyday life.

Firstly, it will explain the story in brief, from the first thought of AI, to the first tries of creating something that could emulate the human brain, all the way to the first employment.

Then is going to introduce the most useful models of AI, from Machine Learning, Deep Learning and Natural Language processing. Explaining the different features of them all, and where they could be operated.

Afterwards, it will analyze the establishment of AI in the financial sector with the general functions, then to start with the introduction of automated financial advisors and the different capacities.

Later on is going to delver into the system of AI working in the financial sector, speaking of Robo-advisor, Algorithmic trading and forecasting systems, with positive and negative aspects.

Lastly the thesis is going to speak about ethical questions, regulations and observations.

2 ARTIFICIAL INTELLIGENCE

One of the most innovative inventions of the modern era is artificial intelligence. The AI is able to emulate cognitive human abilities, like problem-solving, learning, and decisional power; (for those reasons, it can be used in different sectors. These systems are based on algorithms and a series of models that recreate the human brain, generate neural links, comprehend human language, and store information that it will need and use to understand patterns to make better answers to future requests.

2.1 SHORT PANORAMIC ON HISTORY AND EVOLUTION OF AI

Although the first steps of AI's development started in the 20th century with the progress of technology and informatics, ideas and hypotheses about human creations able to think like humans first came from ancient philosophers and mathematicians in Ancient Greece.

In 1956, the Dartmouth conference can be defined as the birthplace of AI, where researchers John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon officially started their studies in this field. The first period following the conference was essential for the development and generation of the first systems, which were the antecedent of the machine learning models.

The "big" development of the AI happened during the sixties and seventies. In this period, the field of Natural Language Processing (NLP) and the models with the capacity to store information like a human brain had a significant improvement. The story of AI can be easily explained by dividing it into summers and winters. Summer is a period of the time where there are lots of fundings, and winter has a decreasing theme. The first winter was caused by excessive expectations, that was not accomplished by the poorly developed technologies of that time. After the first winter, during the eighties and nineties, the AI sector experienced a strong development of models capable of learning capabilities like human neural links. From this period, the first systems were applied in different sectors, but the insufficient computational power and the incapability of solving problems outside of the presented ones set the stage for the upcoming winter.

From the end of the last winter to the start of 2000, artificial intelligence underwent an improvement, thanks to aspects, most importantly, the algorithmic performances, the quantity of available data, and the upgrade of the computational power. The Deep

Learning and Machine learning models evolved (or were designed) thanks to more complicated and elaborated AI, deriving from the use of Big Data and the use of better elaboration capabilities.

Machine learning and Deep learning, with the emulation of the human brain, are all characteristics of the AI that we can find daily in our lives, like virtual assistance systems, Siri and Alexa, all the way through the medical field, like medical diagnosis. Despite the continuous evolution of AI, it can be seen as an evolution without any negative sides; it evokes many questions on the ethical and moral aspects.

2.2 MAIN TYPES OF AI: ML, DEEP LEARNING AND NATURAL LANGUAGE PROCESSING

Thinking of AI classified in one category is simpler, but it is divided on the base of its abilities and complexity. The most important ones, each with different capabilities, are Machine Learning (ML), Deep Learning (DL), and other forms like Natural Language Processing (NLP).

The most important typology is without a doubt, Machine Learning, the most advanced. It deals with models that learn and automatically improve systems. The advanced capabilities of Machine learning allow it to recognize processes without the constant control of a human, making predictions and adapting to the presented different changing scenarios. There are many models of ML, supervised and unsupervised, the most advanced, then we have reinforced Machine Learning; All of them are used in different sectors, like: the medical field or in finance, where they are used to predict the movement of the stock market, a topic that we will discuss deeply later on.

Deep Learning uses designed algorithms based on the human brain in all its capacity, with neural links on more levels. Deep Learning evolved to the point of recognizing a picture and Natural Language processing to understand and make automatic answers. This type of AI is enforced in different fields, like the autonomous guide and in the medical field for the medical diagnosis.

Another form of AI is Natural Language Processing (NLP), developed to understand and generate human language; with ML and DL, it is capable of understanding and writing a dialogue in humanlike ways. The sectors where the NLP is worn are different; in our case,

the interest is focused on the financial topic, where it has the task of analyzing and perceiving the market, utilizing financial reports to interpret and understand the "mood" of the investors. This machine (NLP), like every type of Artificial intelligence, has to answer in particular to a few different ethical challenges. One of the most important ones is that it has to keep a high level of privacy because if not, it won't work as it should; the NLP must interpret and understand texts that come from real people who use those machines.

By looking at those different challenges presented, we can grasp how those machines have a big margin of improvement, thanks to the improvement of the information sector, the large quantity of available Big Data, and the rise of algorithms. Saying so, the best way to take advantage of these new machines is to understand the limits and the value of them all, find in which sectors could be employed, and determine how can they adjust and quantify how they change the sector they are utilized in, creating different assumptions whether AI is positive or negative in every sector.

3 AI IN FINANCIAL MARKETS

The financial world has been changing by AI, and by doing so, the financial market has changed, too. In particular, this machine created a new era in the financial market by having the capacity to analyze lots of data in a very short time, more precise risk management, and the ability to make investment decisions like a normal financial advisor. The efficiency of modern technology allows these systems to study and understand large quantities of data in real time, simplifying the investment, using algorithmic trading, finance management made by Robo-advisor, and forecasting the financial market. In conclusion, AI in the financial sector reduces costs, helps with resource management, and makes more precise decisions on advice and orders.

3.1 GENERAL APPLICATION OF AI IN FINANCE

As mentioned before, AI is enforced in different financial sectors, like trading, market prediction, or counseling, all of them using different models of AI. Automized trading and market prediction use the Machine Learning system, its role is to study and understand the patterns of the market to acquire or sell assets at a high speed that humans can't reach, or it can anticipate the movement of the market. Market Institutions make use of these systems to raise the profit margin and defend or at least lower the risk in case of big market fluctuations.

Regarding risk management, it enforces the ability of Deep Learning; this system helps find and face the problems that come from the market; the DL studies Big quantities of datasets and the operations in the markets to prevent or inform the risks of default of the clients the institution is facing.

Robo-advisors are the last topic we are going to introduce; they work exactly as financial advisors but without the help of a human operator. The work essentially is based on the preferences of the investors and on his prefixed risk rates; on this information, it will create an investment strategy made especially for the investors. The human work in the robo-advisor is almost close to none; this makes it a low-cost service accessible to more people.

3.2 HISTORICAL EVOLUITON AND DEVELOPMENTS

As mentioned before, l'AI over time has gone through several phases of innovation, called "summers" and "winters"; therefore, the financial sector has also been affected by them, slowing down its use and progression. Between the 80s and 90s, however, the first models that worked on trading algorithms were adopted, used to improve the speed of operations, used by hedge funds and financial institutions. Unfortunately, the low IT power, in addition to the low amount of data, slowed down the improvement and sometimes, prevented the use of AI models.

In the early 2000s, there was an advance in informatics power and the birth of Big Data. AI began to gain prominence, being used by hedge funds and investment banks for its forecasting and management capabilities. In addition, thanks to the new Deep Learning machine, also financial analysis was improved.

Thanks to AI, there was been a revolution in fraud detection and monitoring illegal activities. Security platforms, through Machine Learning models, are able to prevent hacking attacks and souspicious transactions, and, consequently, the economic loss from them.

3.3 SMALL OVERVIEW ON DATA AND NLP

Even within the financial markets, AI exploits the impressive amount of data available, through the analysis of Big Data: which are big datasets made from financial news, social media or financial documents from companies. These Datasets are then interpreted and processed for investors and financial advisors.

Natural Language Processing is essential in the finance sector among the various AI models, as it is capacities allow it to process the "emotions" of the market, thanks to its skills also it's able to understand and study news, documents and interpret socials media for any future trends. NLP simplifies in terms of speed of decision on financial transactions, but it is also used to help financial institutions with bureaucracy, increasing the efficiency in the administration of regulatory requirements.

Although these models and new technologies bring a great competitive advantage to those who use them compared to those who don't use them, many questions arise about how invasive AI can be and how it may not respect user privacy regulations, as its ability is

precisely to process even private documents. In addition to this, used in unlawful ways, these Ars can create an illegal advantage in the financial markets.

The development of AI is constantly improving, both in financial field and in other sectors, the models will continue to evolve, for this reason, the task of operators is constantly changing and in the future the task has a role yet to be defined.

4 AI SYSTEM IN FIANCIAL MARKETS

This chapter explains the most used and advanced AI models, which are being employed in the financial sector, giving an upgrade on different actions, we are going from automazione consulting, to algorithmic trading to finally talk about forecasting the trends of the financial markets. Explaining boundaries, ethical limits and effects on the market.

4.1 ROBO-ADVISOR

The first argument we are going to introduce is an innovation in the sector of counseling, Rob-advisors. Their role is to work as a financial advisor, without the help of a human. They have the ability to process data and provide financial investment advice to its clients. The absent human help makes robo-advisor a financial tool, more affordable than normal financial advisors, which the fast diffusion makes it a risk to regular advisors.

4.1.1 METHODOLOGY

Robo-advisors work through quantitative models, every level corresponds to different investment strategies. These models process the market and the datasets and based on the risk levels set by the client, generate portfolios that are optimized for the investor. They also follow theoretical models, like the Modern Portfolio Theory, the most widely used in this field, which works on diversifying financial assets, minimizing the risk of loss in the client portfolio. MPT has an important aspect to make it work well, that is the way investors behave, they should be rational about the allocation of resources, without worrying about the market trend. Moreover those who follow the MPT should have different assets with a similar level of risk and a assets with different levels of profitability, to build a stable portfolio.

Conditional Value at Risk (CVaR) is another theory of risk on which rob-advisors are based; it shows us what the maximum loss of an investment could be over a given period of time, allowing the robe-advisor to offer a more precise financial advise during times of market fluctuations. Robo-advisor uses different models that allow them to adapt better and better in volatile conditions, thanks precisely to Machine Learning models.

Despite this capacities, rob-advisors must still take into account the irrationality of the investor, so to examine the investor’s behavior and help not make mistakes, such as too

much sensitivity toward the market fluctuation or investments with inadeguate gains compared to the emotional weight, AI models analyze big datasets that helps process and store information of all kinds, including financial news and the “emotions” of social medias. This ability comes from the use of NLP, which allows real-time management of assets. The relationship with the user is also essential, the hub and the interface allow the investor to express hi risk preferences and strategies, suggestions are shown in real time, giving the customer the right to decide his type of time strategies.

4.1.2 BOUNDARIES OF ROBO-ADVISOR

However, there are several limitations and even disadvantages that can range form a difficult customization of strategies, to the difficulties of predicting the markets or a major problem of privacy, where the transparency of algorithms is still a problem that reduce the diffusion. However, Robo-advisors are very advanced system that though are not able to replace human judgment or can’t feel or understand investors emotions or problems that comes from the very day life, such as familiar or other situations. While for the prediction of the markets there are limits that robo-advisors cannot overcome, despite the fact that they process most of the data on the web. The limit is given by the problem of economic or geopolitical unforeseen events, such as wars or crises. The moments of fluctuation that these events lead puts robo-advisor in difficulty, because they fail to inform the investor, putting his investment at risk of major losses.

With respect to the regulations, there is still a very high level of uncertainty, since the norms are not yet developed to face di algorithms, risking to not be able to protect investors, both from a financial and IT security perspective; therefore, the risk of privacy violation and fraud raise questions about legality and blame in case of losses or wrong advice.

Given their practicality and convenience over a normal financial advisor, this system is in a continuous grow, but it will be necessary to continue to improve weaknesses like adaptation to fluctuations or improving transparency.

4.1.3 CHAT GPT AND ROBO-ADVISOR COMPARED IN THE FINANCIAL SECTOR

Chat GPT and Robob-advisor, are the result of artificial intelligence, they are both tools that can offer decision support methods and investment suggestions to users, operating through different methods, as I will report below, trying to highlight the strengths and weaknesses for each technology.

Robo-advisors analyze market fluctuations, macroeconomic data and how assets behave in real time, uninterruptedly, while ChatGPT, using pre-existing information, is unable to make forecasting in real time; this because, like said before Robo-advisors act based on quantitative models and pre-set portfolios management algorithms;

Rob-advisors works with statistical models, mathematical models and with strategies as said before such as Modern Portfolio Theory; while ChatGPT is unable to ensure that the given financial advice are appropriate of the information received. Moreover, ChatGPT, running the risk of acquiring inaccurate information, risks offering wrong advice, in a field where precision is required. So, what does ChatGPT offer that kobo-advisor can't?

Chat GPT can interact with users in a more dynamic and personalized way. So an investor, especially a novice, can receive more accurate and in-depth answers to specific questions on investment strategies and market analysis, information that robs-advisors cannot offer, because they work on mathematical models and algorithms that offer more specific and more technical answers. By saying so we can define the interactive capacity of ChatGPT as very advanced, very useful for financial education and assistance to non-expert users who can learn the different investment strategies.

No less important is the aspect related to regulation and the responsibilities of the information provided; while robe-advisors must comply with strict financial regulations, through transparency checks and accountability for the recommendations provided, ChatGPT, on the other hand, not being regulated as a financial advisory tool, can provide answers to users that may be inaccurate and should be taken with caution.

In conclusion, ChatGPT and rob-advisors are both different and useful, but for different needs and goals. Robo-advisors, in fact, is a high reliable tool for automated investment management, while ChatGPT is preferred in personalized assistance, in explaining financial concepts and answering questions in conversational way.

A solution would be a system that in the field of Artificial intelligence, obviously applied in the field of finance, could see a combination of this type: ChatGPT could provide information support and rob-advisors could perform operations based on the statistical and learning models observed previously.

4.2 ALGORITHMIC TRADING

Another AI-based is algorithmic trading, which works on the the basis of mathematical models to place orders on the financial markets, they place orders without human help, processing the markets in real time. Thanks to these models new investment strategies have been developed.

This tool, as we have seen above, is based on prediction models, adapting to market volatility. For example, one of the most advanced forms is the strategie of High Frequency Trading or HFT, which identifies thousands of transactions in fractions of a second, taking market fluctuations in favor, where the price change is equal to even cents. This algorithmic trading models are used today by financials institutions, banks or hedge funds, and also by private investors that have the availability of servers and forecasting models. The main purpose is to increase the speed of execution and decrease the effect of emotions on investment strategies on any kind of temporal strategie.

4.2.1 BENEFITS OF ALGO TRADING

The financial sector has changed tremendously with use of algorithmic trading, enhancing it with the advantages of speed, accuracy, and risk management skills.

Let’s look specifically at how algorithms act and their abilities:

- Operations can be carried out “lightning fast”, with the use of algorithms that process the received data in an infinitesimal time and are able to respond to the fluctuation of the market instantly. For example, with the changing of prices, it can acts quickly giving competitiveness, sometimes a non-ethical advantage, to those who use this system, like High-frequency trading.

- Movements and orders take place through precise mathematical rules and more rational predefined procedures, preventing impulsive actions dictated by emotionality that can emerge when facing sudden fluctuation in the market trends, which may happen when operation controlled by humans, even if specialized and trained, incase of a market collapse or excessing purchase during a bearish market.

- With algorithms you can have multiple markets and assets under control at the same time, seizing investment advantages even on a global scale; The results of this capacities? The portfolio will be diversified, and operability will be better. Thanks always to the speed of analysis, it will be possibile to quickly identify any losses or correcting investment actions before it becomes a risk of loss; therefore, automation, so working without the human help, will reduce costs, improving risk management.
- By optimizing the execution of orders on the financial market, for example, splitting a large order reduces the impact on the price in the market. A procedure widely used by institutional investors who, managing big quantities of capital, try not to alter the value of the negotiated agreements.

Algorithmic trading has also some critical issues: by relying on it excessively, it can lead to situations of volatility, like a sudden flash crash (market crash), that is going to increase a simultaneous withdrawal of automated orders; and also, given the increasing complexity of machine learning models (overfitting), using historical data in an exasperated way, despite the fact that there is no certainty of future market scenarios.

However, algorithmic trading is constantly evolving and has become a substantial part of the global financial market.

4.2.2 HIGH-FREQUENCY TRADING

High-Frequency Trading, as previously mentioned, is a type of trading that is based on models that execute large number of trades by taking advantage of market fluctuations. The way of doing operations brings with it various effects, both positive and negative, that we will face later on. In order to be able to work at its best, HFT needs a very fast execution speed, capable of beating other market participants on the rapidity of orders.

Banking institutions and corporations invest a lot of capital on improving the technologies, devices, and infrastructure connected to them.

4.2.2.1 SUB-PENNY JUMPING

HFTs have different methods or techniques, one of them is definitely Sub-penny Jumping. This strategy allows to acquire a benefit on lots of different orders, taking advantage of the speed the operation, tracking orders of other investors, emulate them and slightly increasing the value, by doing so, positioning the slightly increased order in front of every other order on the precedence books.

Going deeper into this strategic model, Sub-penny Jumping is based on Price stepping; in particular, companies that use this strategy use algorithms that can track large orders, for them to emulate the same orders with the differences smaller than one cent, by doing so you overcome both in rapidity and priority, preventing the share price to change.

These models raise many questions about the negative impact this strategy can have those who use these models, execute trades at better prices than other investors, because this orders by moving a large amount of capitals can influence the market, by bringing very high price fluctuations, thus creating an unfair advantage over other investors. Some companies that apply these algorithms to anticipate other orders, reside with their servers near the most important exchanges in the world, to intercept orders by working on latency.

4.2.2.2 IMPACT OF HFT

The impact of HFT on financial markets is often criticized and discussed. In particular, there are many debates about whether it is a strategy that brings only benefits or also negative aspects. Certainly, there are more positive aspects ranging from: greater market efficiency, to more liquidity present in it, while the negative aspects are mostly against the transparency and fairness of these operations

However, let’s start first by talking about how much HFT transforms the market, and how much potential it has to improve it even more, certainly from its first use, thanks to the speed it is able to reach that is far from human capabilities, the liquidity present in the market is increased significantly, thus reducing the discrepancy between the bid price and

the ask price, I.e. the bid-ask spread. While this may seem like a positive aspect, this liquidity could disappear very quickly, putting investors at risk, with unexpected market swings.

With the revolution on the speed of operations, that lead to the increasing of efficiency of the market, affect both the behavior of the market in the event of unexpected scenarios, improving its responsiveness and transparency both on quotations which will have a more accurate price based on market news. Although the speed, and with it all the positive aspects may seem like a market improvement, it is stillsubjeut of discussion, how this increase in fluctuations can lead to flash crash events, i.e. rapid collapse of the stock markets that lose many percentage points, recovering later on within few minutes. An example of a flash crash event is the crash of one of the American exchange the Dow Jones that lost almost 1000 points in 2010. These episodes highlight the addiction and risk of these algorithmic models.

HFT are also under debate for the integrity, as they often create higher advantage for those who use them. For example, as mentioned before, trading companies invest heavily on IT efficiency, in addiction to positioning themselves close to stock exchanges to have an advantage in terms of latency and data speed that create an imbalance towards investors who do not have this type of capital or IT power. To limit these inequalities and regulate these systems, the competent organization in Europe and America, with their respective MIFID II and the SEC, try to impose greater transparency on orders and data, thus reducing the risk of manipulation of the financial markets.

This strategy as certainly brought benefits to the market, but remained a subject of discussion, even after regulations. For the future, it will be necessary to find balance or solutions between the various negative and positive aspects. To prevent strategies such as Sub-penny Jumping from creating to large of a gap between companies that invest lots of money in IT infrastructure and normal investors. As said before, the authorities are constantly trying to prevent the market from being unfair and instead making it accessible to all.

4.2.3 FORCASTING MODELS

This chapter speaks about how Machine learning and its strategies changed the analysis and the forecasting of the financial markets, Thanks to his capabilities. The use of those types of models is increasing, in relation to their different functionalities, their possibility of data analysis and the powerful skill of identifying trends and searching for similarities with old patterns. The rising of ML is also attributed to the evolving of the dataset with are essential for the performance of these systems.

4.2.3.1 MACHINE LEARNING TOOLS FOR THE FINANCIAL PREDICTION

Today, in fact, financial analysts are able, through the use of ML models, to acquire vast amounts of information on the behavior of world exchanges, both present and past, giving then outputs to than make the analyst decide for the purpose of the investment.

Specifically, ML models compare information from the markets over time, such as:

-the opening and closing prices of the stock exchange;

-the quantities of transactions made;

-the fluctuations and averages

-specific assets that grow or decrease

Moreover, analyzing information from macroeconomic sectors, inflation, GDP growth and interest rates. The ML in order to make a more precise forecast for the purpose of the investment, needs to analyze multiple plans of interest. The focus is to predict or “feel” the changes on the market trends in advance or in any case, being able to manage possible fluctuations better.

There are still many factors that are difficult to predict relating to geopolitical and social events that also generate economic crises and remind us that we live in an interconnected world. We know that innovation is constant and that, even if the are critical issues, all this cannot be stopped, the various players in the financial market continue to invest in

artificial intelligence applications, trying to contain risks more and more, taking advantage and acquisiting high-quality datasets.

For the predictions are being used different technics that make use lots of different AI models, like, classification and regression models, ANNs and DL or time series models.

CLASSIFICATION AND REGRESSION MODELS

Machine learning is mainly based on classification and regression models:

-Regression models are statistical models that evaluate the relationship between one dependent variable and one or more independent variables using a line. These models are used to calculate the value of a asset in the future using historic variables. Regression models are divided into linear regression and logistic regression:

- Linear regression is a statistical technic which is used to explain the relationship between two or more variables. It measures the trends followed by prices over a period of time and is based on the interpolation of prices, y = a + bx, where x is the independent variable (time) and y is the dependent variable (price). With linear regression you can "build" a trendline, which would be nothing more than a price containment channel, placed onto the financial charts to follow the trend of the stock. How do you define a bullish or bearish stock? A stock is defined as bullish when the value remains above the trendline, to be bearish, vice versa. The following picture shows an example of trendline.

- Logistic regression is a type of analysis that predicts the probability of an event occurring. Using this statistical technique, it adds flexibility to the model by allowing nonlinearity of features.

-Classification models are divided in Support Vector Machines (SVM) and Random Forest:

Support Vector Machines is a supervised learning system for the classification of linear and nonlinear outputs, that divides the data into two different classes. The SVM finds the output thanks to a hyperplane using vectors and margins.

Random Forest is a machine learning procedure used to make predictions. They are simple models that use binary splits on prediction variables, to determine outcome prediction. The use of these models is simple because the predictive outcome splits between “high” and “low” values. Random forest is the most accurate in prediction among the other classification models, they also have the ability to use very large dataset with a lot of prediction variables, however, to make the prediction more accurate it needs to reduce the numbers of variable and make a selection with the important and more needed variable.

These two models are used to classify a stock by appointing her in “rising” or “falling”.

NEURAL LINKS AND DEEP LEARNING

ANNs and DL brought, with more precision, the ability to analyze big datasets, the more data is becoming available, more these systems will be the first tool on the forecasting of stock markets. ANNs are capable of finding an association between data, in other periods of time, even if there is no correlation. The most important ANNs are three, all of them with different characteristics on the forecasting of assets. The first one is Feedforward Neural Network (FNN), uses back propagation as a technique for training. FNN finds nonlinear schemes, to spot prices and correlations between different assets, in particular Long Short-Term Memory (LSTM) is capable to store information from the network and use it in another time period for different task that has the same outcome request. These abilities allow it to make price prediction on stocks. Convolutional Neural Network is the most used in order to image recognition. CNN is divided in three steps: convolutional layer, which uses filters to obtain a feature map; the second layer is the subsampling layer, which is a pooling layer, that works on different inputs with same features; the last layer is the Fully-connected layer, which makes nonlinear outputs. With these abilities it's enforced in finance, with the role of analyze charts and finding repetitive patterns.

MODELS BASED ON TEMPORAL SERIES

Another important role in the forecasting of financial markets are the time series, essential for the understanding of future trends. The models used are ARIMA and GARCH.

Autoregressive Integrated Moving Average like said before, is an instrument used for the time series. It is divided into Autoregressive (AR), Integration (I) and moving average (MA), the division of the tasks, increase the precision in predictions. AR uses old data of variables to forecast the future value, concentrating on how past datasets can affect present charts. It founds how much earlier different situations affect present patterns. Integration transforms the series into one that doesn't move, where average and spread don't change as time goes by. The MA improves itself by using his mistakes to shape error part, doing so, it reduces variations and improves the prediction. ARIMA in trading can be used for risk management by forecasting fluctuation and patterns, helping traders to arrange in case of potential losses.

Generalized Autoregressive Conditional Heteroskedasticity is a statistical model used to predict the volatility of return on financial assets. The outputs of this model help figure

which asset will have higher returns, and by doing that, helps with the portfolio optimization. GARCH models are used when the fluctuation of the error term is unstable, so by using a constant variable, the output from the model will not be a believable response.

5 CONCLUSIONS

Artificial intelligence is becoming more and more established at all levels. In Medicine, just to give an example, has node a great breakthrough in the use of this precious tool and today no one would ever think of a return to the past or a disengagement. Even in law, section that is more prone to forms of technological illegal actions, AI is finding more and more space, which due to regulatory provisions, first European and then Italian, will not yet be used for judgements but certainly for all preparatory and organizational activities. The financial system could not be an exception also because progress does not show up by knocking on the door but enters without asking permission.

It is therefore necessary to be prepared. The old debate on how far human should go and where the machine should stop is perhaps now outdated because there can no longer be a proportion, in the financial sphere, for example, between a system that uses AI and one that does not there is too much imbalance. It will therefore be necessary to think in other terms, that is, to think further: reduce possible errors and to provide for those who will be entitled to compensation for damages that such errors may cause, particularly large in the financial sector. This is the challenge that human must accept: to have moral strength not to be overwhelmed by the machines, the legal force that regulates the system to limit and contain any mistakes, and to punish those who make them and, finally, to have the economic strength to afford an extraordinary useful and high-performance system but imperfect like everybody else.

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